Non-zero magnetic field sensor for magnetoencephalography

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Prototype of a compact room temperature OPM sensor suitable for magnetoencephalography (MEG) and operating in a wide field range are designed and tested. The sensor prototype uses the effect of decrease of spin-exchange relaxation rate by high optical pumping [2,3], it utilizes two-beam M_X-scheme with balanced polarization rotation detection, and the laser pumping from lower hyperfine level (F=3) of Cs ground state [4]. The scheme was tested in gradiometric setup. The work was performed at Ioffe Institute, St. Petersburg and funded by National Research University "Higher School of Economics" (HSE), Moscow.

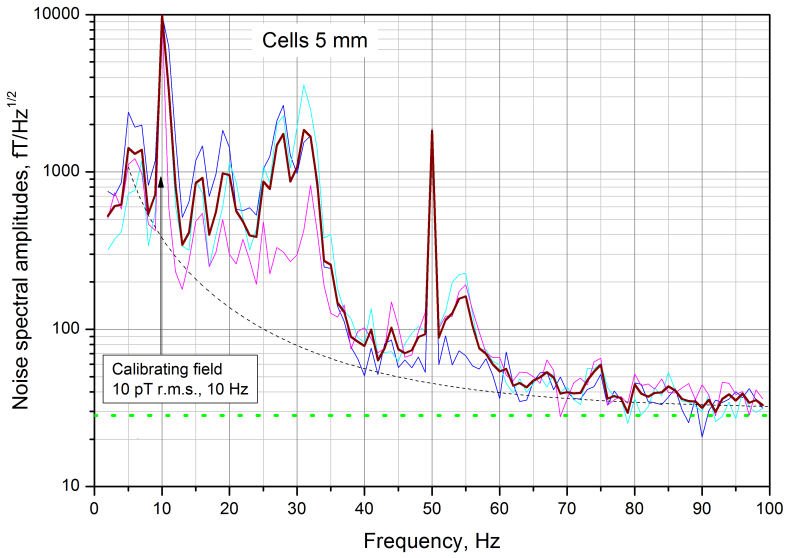

Figure 1. The low-frequency spectrum of the magnetic noise gradient measured by two 5 mm-sized cells separated by 10 mm inside a magnetic shield at B=12 μT; color lines represent an example of three separate noise records. Differential noise amplitude is $\sqrt{2}$ times higher than that of a single sensor.

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